

MAY 16
COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS.

U. S. Department of Agriculture
and State Agricultural Colleges
Cooperating

States Relations Service,
Office of Extension Work,
Washington, D. C.

BOYS AND GIRLS RADIO CLUB DEMONSTRATIONS.

This circular contains information prepared jointly by the Bureau of Standards, Department of Commerce; Bureau of Markets and Crop Estimates, and States Relations Service, Department of Agriculture. It suggests to county extension agents methods of organizing and conducting radio club work with boys and girls.

A Farm Need

The farmers of every community have long been in need of accurate and current information on weather forecasts, crop conditions, and market quotations to guide them in their daily farm operations.

Information on these matters which comes through the mails often loses much of its value because of time consumed in reaching the reader. Radio communication reduces the time consumed to a minimum. It has developed to such an extent that it has become a practical convenience for the farm, but before it will be widely used its practicability will have to be demonstrated.

Solution Through Boys and Girls Radio Clubs.

This opens a splendid opportunity to the county extension agents. To conduct radio demonstrations through boys and girls is to grasp this opportunity and contribute to the solution of a problem that is universal. Such clubs receive and disseminate daily information on weather forecasts, crop conditions, and market quotations. Each member sets up and uses a receiving outfit, thus demonstrating its usefulness. The outside world in this way is brought to the farm home door-step. By disseminating the information received to other farms by telephone or through notices, the radio club member serves his community and adds to the desirability of farm life. These facts are already established by the experiences of boys and girls radio clubs during the past two years.

Leadership

The local leader need have no technical training or experience in wireless operations if he has sufficient interest in the project. Especially is this true in States where the college of agriculture gives assistance through trained specialists. However, extension agents can usually find leaders who are familiar with the rudiments of wireless operations and their services should be secured wherever available. Oftentimes, one of the older members is qualified for leadership because

of his radio experience.

Members

This undertaking appeals strongly to the imagination of young people for it puts into their hands a means of communication not yet in popular use.

The local leader, assisted by the county extension agent should therefore exercise care in securing members. Otherwise he may enroll many who are unable to actively engage in the work.

The leader should secure as members, boys and girls at least twelve years of age and preferably fourteen, who are farm residents. The applicant need have no knowledge of radio but should be in a position to secure the necessary equipment.

Organizing the Club.

The members should organize into a club in order that they may get suggestions and information from each other and from the leaders; and that they may develop ways and means of best serving the community through wireless reports by joint effort. A club should consist of five or more bona fide members, and a president and secretary should be elected. It may be desirable to elect a manager, especially when the club maintains headquarters for receiving or posting reports. A club may draw its membership from the entire county, but there are numerous advantages in confining it to a community if there are sufficient members.

Meetings.

At regular club meetings the members will want to study and discuss laws regulating wireless operation, codes, individual problems and experiences, to witness demonstrations in the setting up and use of receiving and sending apparatus, and to practice code. Radio clubs have an unusual opportunity for entertainment when a wireless telephone is available by receiving important public addresses and musical entertainments for the people of the community.

Records.

Each member should make a duplicate of each wireless report received and at the end of the week forward them through the local leader to the county club agent or county agricultural agent. On the blank provided he should keep a record of each report received on weather, crops and markets. These records will be studied and compared occasionally at club meetings, and when summarized will constitute the demonstration record for the year, which is to be filed with the county extension agent.

Posting Wireless Reports.

Wireless reports may be posted regularly each day in some public place where the people interested may see them. The office of the county extension agent, the post office, or store, or road crossing may be suitable. When all the members of a club live in one community and each is receiving reports, then they may take turns by weeks in posting reports. When the members are more widely separated each may post reports in his neighborhood, another method is to telephone the information instead of posting it. Before a member is given the responsibility of posting or telephoning his report, his accuracy in receiving should be tested.

Distance from Transmitting Station

Type of radio wave. - The questions of wave frequency or wave length and the kind of transmission used by the transmitting station from which the club member will receive reports are both important. The Air Mail Stations of the Post Office Department use the type of wave known as continuous, or a wave length of 2500, 3000 and 4000 meters. The broadcasting of weather, crop and market reports by most other stations officially designated is done on an assigned wave length of 485 meters. Club members using the simple crystal detector will be able to receive only the latter kind of broadcasted reports, and must be located within 15 to 25 miles of a radio telephone to receive signals regularly. For this reason it is advisable that in the beginning, radio clubs be organized near the State college transmitting station or other station transmitting weather, crop and market news on a wave length of 485 meters. Wherever the members of a club are able to purchase the more expensive equipment that will receive messages from greater distances and from stations transmitting continuous waves the distance from the station is less important. Amateurs who themselves transmit are licensed to operate on wave lengths not to exceed 200 meters. If such an operator is near by the club members, the latter will usually be able to receive messages with the crystal detector receiving set, which will afford practice.

Type of transmitting set. - The stations from which the market reports are now being sent by radio, the type of transmitting sets, the wave lengths used, and the times at which the several reports are sent are given in transmitting schedules which are usually furnished on application by the agency supervising or directing the transmission. They are also published in the Monthly Radio Service Bulletin of the Department of Commerce.

Arc stations often have a greater transmitting range than the spark stations. Furthermore, it should be borne in mind that spark and radio-phone stations transmit damped waves and the arc stations transmit undamped or continuous waves. This information is necessary for the selection of the proper receiving sets.

Radio Telegraph and Radio Telephone Transmission.

The subject of radio telegraph (code) and radio telephone transmission has been touched upon above. All things in readiness, radio telephone transmission would be the logical method to use. At present, it is difficult to purchase reliable, high-powered radio telephone transmitting equipment on the commercial market. Furthermore, if the Bureau of Markets and Crop Estimates had waited until the high-power telephone transmitter had become commercially available it would not have made the more than a year of gratifying history which its service now has, and the Weather Bureau would not have had its six years of experience in the dissemination of weather forecasts. After the broadcasting of market news and weather reports by radio telegraph was shown to be practicable it was decided to use the radio transmitting stations of the Air Mail Service which were already installed and in operation. This forms the first trans-continental chain of information disseminating radio stations without the delay and cost of constructing new ones. It is probable that these and other like ones may remain the master stations for some time.

Furthermore, when the Department of Agriculture is successful in its work of getting the various State, county, and private organizations to equip themselves to receive the radio telegraph (code) weather, crop and market reports, great advancement will have been made, for those stations will be ready to rebroadcast the reports by radio telephone when that system is installed*. A radio receiving station that will pick up the telegraph messages will, without any alteration, pick up the radio telephone messages.

The Radio Receiving Set.

Type of receiving set.— The extension agent, in determining suitable types of receiving equipment for the use of club members, will find so much equipment advertised that he may be nonplused. The Bureau of Standards which has collected and tested many types is providing this information through the Department of Agriculture to the agents. The first of this series is now being prepared by the Bureau of Standards.

Radio receiving sets are of two general classes: (1) those suitable for receiving signals from sets which transmit damped waves, modulated waves or radio telephony, and (2) those suitable for receiving signals from the above types of sets and also from stations which transmit unmodulated or continuous waves. Damped waves are emitted by spark transmitting sets. The Air Mail Stations which are used for transmitting market reports are arc stations, sending on continuous waves 2,500 to 4,00 meters in length.

*Inasmuch as the service is going through a period of rapid development and the number of stations sending the reports is rapidly changing, anyone desiring up-to-date information as to the extent of the service should communicate with the Bureau of Markets and Crop Estimates, or the Weather Bureau of the U. S. Department of Agriculture, Washington, D. C.

A receiving set of the first class referred to above may be a very simple set equipped with a crystal detector. Such a set can only be used for receiving over moderate distances. Most receiving sets of the second type referred to above use an electron tube detector to which may be connected an amplifier of one or more stages. The crystal detector is suitable for receiving radio telephone signals at points nearby the transmitting station. In certain localities near to radiophone sets which are broadcasting the market reports, it may be possible for amateurs to use the crystal detector sets, but the broadcasting by the Post Office Air Mail Stations is done mostly on long waves by the use of continuous wave radio transmission. This does not necessarily mean that club members will have to purchase expensive equipment to avail themselves of the market news. The majority of these sets can be adapted to receive messages at the longer waves by such means as the addition of loading coils or by rewinding some of the coils in the sets. High school or college teachers of physics or electrical engineering can frequently give assistance regarding this point and others relating to the receiving equipment.

If one plans in advance, it is not essentially more difficult or expensive to obtain equipment that will receive at the longer wave lengths than at the shorter ones.

Many matters such as the wave length have not been finally determined. In fact, temporarily a reservation of wave lengths of 485 meters for the dissemination of broadcast market and weather reports has been made in order to avoid interferences from other sources. It is probable the Federal Government will regulate and assign wave lengths for all purposes.

In purchasing apparatus for the reception of radio weather, crop or market news from a given transmitting station, one should state the wave length range which it is desired to cover, name of and the distance from the transmitting station.

Cost of receiving sets. - Any attempt to give the cost of commercial radio receiving sets is attended with difficulties. Some sets may be designed in which dependability is the sole criterion, while others may embody fine appearance with dependability. Showy, unreliable sets are not to be considered no matter what the cost, for service is of prime importance.

A crystal detector receiving set suitable for receiving radio telephone messages from comparatively nearby transmitting stations are advertised for \$10.00 and higher, depending on the accessory equipment included with the set, or it can be constructed by the club member at a somewhat lower cost. Reliable radio receiving equipment such as is now on the market or which may be especially built for market news reception from the continuous wave stations will probably cost completed between \$50 and \$200. These prices cover the range of sets from a simple electrom tube detector

set to the more complex receiving set complete with detector and amplifier panels, storage battery, dry batteries, telephone receiver, electrom tubes, and possibly some simple antenna equipment.

Factors Governing Reception.

The Bureau of Markets and Crop Estimates is undertaking to establish the radio market news service on an efficient basis. There undoubtedly are many obstacles in the way of making it an immediate, complete success, but so far as these have been considered up to the present time, they are not insurmountable and it is thought that with the cooperation of State and local agencies and suggestions from radio operators located over the country who are receiving the reports, it may well be that the Bureau of Markets and Crop Estimates will be able in a very short time to put the service on an entirely practical, substantial basis. At the present time, it is largely dependent upon the cooperation of the Post Office Department and State, local and private agencies in the dissemination of the reports, and they are giving their heartiest assistance to the Federal bureaus in this work. It will be some time before receiving stations will be distributed all over the country, receiving the reports, regularly. A great many of the licensed amateur operators are receiving the reports and many of them are fully competent to do this. However, it can not be considered as on a permanent basis until the State and county agencies have made provision for equipment and regular operators to receive the reports regularly. They are all controllable factors. The apparently uncontrollable factor which must be given consideration is the one of natural conditions, such as weather and other atmospheric conditions. These will be real obstacles which in some localities and in some seasons will be found worse than in others. During midsummer, radio reception during daylight hours may be occasionally interrupted.

At times during the summer months, the strays may completely drown out the radio signals picked up by the receiving set. The idea that the addition of more sensitive amplifiers to the receiving set will relieve the situation is erroneous. The amplifier amplifies the strays along with the incoming signal, so the amplifier signal is often less intelligible than the signal received on a simple detector. The use of high-power transmitting stations is an advantage in this respect.

During severe electrical storms it sometimes is not only impossible to receive any messages, but it may be unwise. At such times the antenna should be grounded to protect the apparatus and no attempt made to receive radio messages. Occasionally the transmitting range of a station will be limited in a certain direction owing to an intercepting dust storm. There are also other difficulties, such as fading of signals, which must be encountered, but some of these are avoided by suing the long waves. However, after taking all of these things into consideration it is probable that a high percentage of completeness may be anticipated in handling this kind of service.

Sources of Information

There are given below references to sources of information on radio for those not already conversant with the subject. This material has been compiled by the Bureau of Standards. It should not be considered complete, for additional sources are continually becoming available. It does, however, point out valuable and necessary information to those who are interested in operating radio stations.

Periodicals. - Persons interested in the more elementary phases of radio communication can keep in touch with radio development which will be of interest to them by arranging to see regularly the issues of one or more of the following periodicals:

- Q.S.T. Published by the American Radio Relay League, 1045 Main St., Hartford, Conn.
- Radio News, 233 Fulton St., New York.
- Wireless Age, 326 Broadway, New York.
- Radio, Pacific Bldg., San Francisco, Calif.
- Radio Topics, 4533 North Sawyer Ave., Chicago, Ill.
- Wireless World, 12 Henrietta St., London, W.C. 2, England.

Persons who have had technical training in electricity and radio communication will be interested in the "Proceedings of the Institute of Radio Engineers", 140th St. and Covent Ave., New York City, and the "Radio Review", 12 Henrietta St., London, W.C.2, England.

Publications every club member should have. - Every leader of a radio club, and as far as possible every member, should subscribe to the "Radio Service Bulletin," a monthly publication by the U. S. Department of Commerce. It is the best means of keeping in touch with Governmental radio matters. It contains news regarding radio regulations, radio traffic information, additions to the list of radio stations in the United States, and short articles on important developments in radio. A subscription is secured by sending 25 cents per year to the Superintendent of Documents, Government Printing Office, Washington, D.C.

All persons using a radio station should be familiar with the United States radio laws. These are given in the pamphlet, "Radio Communication Laws of the United States," issued by the Department of Commerce, Bureau of Navigation, Radio Service, of which a copy can be obtained for 15 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

All club members who desire to secure additional information on radio and to understand its principles should secure a copy of Radio Pamphlet No. 40, entitled, "The Principles Underlying Radio Communication." This was prepared by the Bureau of Standards and was originally intended for the education of radio operators in the Signal Corps, U. S. Army. It is an

elementary textbook of 354 pages, giving an introduction to electricity in general and to the fundamentals of radio. This may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. An up-to-date edition is about to be issued, and the price may be ascertained from the Superintendent of Documents.

Other important information - The Superintendent of Documents, Government Printing Office, Washington, D. C., will send without charge, on request, a copy of "Price List No. 64," which includes a list of Government publications of radio interest. The Bureau of Standards issues a list entitled, "Radio publications of the Bureau of Standards," which contains the names of publications of technical interest. A copy of this list may be secured by addressing to the Radio Laboratory, Bureau of Standards, Washington, D. C., a request for Letter Circular 40.

A valuable reference book on matters of radio interest is the "Year-Book of Wireless Telegraphy and Telephony," published in May of each year by the Wireless Press, Inc., 326 Broadway, New York, N.Y.

The International Morse (Continental) code is given in the Government publication "Radio Communication Laws of the United States" mentioned above and also on a small card (Form 773A) obtainable from the Department of Commerce, Bureau of Navigation, or from the district radio inspectors.

The following radio books which will be found useful may be found in many public libraries:

Books Suitable for the Beginner.

Admiralty Handbook of Wireless Telegraphy. London, His Majesty's Stationery Office, 1920.

Bucher, E.E. Practical Wireless Telegraphy. Revised edition, New York Wireless Press Inc., 1921.

Bucher, E.E. Wireless Experimenter's Manual. Revised, New York. Wireless Press, Inc., 1920

Edelman, P.E. Experimental Wireless Station. Revised. New York, Norman W. Henley Publishing Co., 1920.

Hayward, C.B. How to Become a Wireless Operator. Chicago, American Technical Society, 1918.

Robinson, S. S. Robinson's Manual of Radio Telegraphy and Telephony for the use of Naval Electricians. 5th revised edition. Revised by D. W. Todd and S. C. Hooper. Annapolis, Md., United States Naval Institute, 1919.

Sleeper, M. B. Design Data for Radio Transmitters and Receivers. New York, Norman W. Henley Publishing Co., 1920.

Sleeper, M. B. Radio Hook-Ups. New York. Norman W. Henley Publishing Co., 1920.

Elementary Texts for Study

Goldsmith, A.N. Radio Telephony. New York. Wireless Press Inc., 1918.

Hawkhead, J.C. Handbook of Technical Instruction for Wireless Telegraphists. Second edition. Revised by H. M. Dowsett. New York, Wireless Press, Inc., 1918.

Robinson, G. D. and Holland, B. L. Modern Theory and Practice in Radio Communication. Annapolis, Md. United States Naval Institute, 1920.

Stone, E. W. Elements of Radiotelegraphy. New York. D. Van Nostrand Co., 1919.

More Advanced Texts Suitable for Reference

Dowsett, H.M. Wireless Telegraphy and Telephony: First Principles, Present Practice and Testing. New York. Wireless Press, Inc., 1920.

Circular No. 74 of the Bureau of Standards, "Radio Instruments and Measurements". Obtainable from the Superintendent of Documents, Washington, D. C., for 60 cents.

Laws and Regulations.— The laws of the United States require that every radio station used for transmitting signals must have a station license. These licenses are issued by the Bureau of Navigation of the Department of Commerce, Washington, D. C. The United States is divided into nine radio districts. Each district has a radio inspector, whose address is given below:

1st District, Radio Inspector, Custom House, Boston, Mass.
2nd " " " " " New York, N. Y.
3rd " " " " " Baltimore, Md.
4th " " " " " Baltimore, Md.
5th " " " " " New Orleans, La.
6th " " " " " San Francisco, Cal.
7th " " " 2301 L.C. Smith Bldg. Seattle, Wash.
8th " " " Federal Bldg. Detroit, Mich.
9th " " " Federal Bldg. Chicago, Ill.

Requests for application forms for licenses, or for information concerning licenses, should be addressed to the radio inspector of the district in which the station is located, or, if this is not known, to the Bureau of Navigation, Department of Commerce, Washington, D. C. A station which is used for receiving only and does not transmit, does not require

a station license. The operator of a station used for transmitting purposes must have an operator's license, in addition to having a station license.

The station license issued for the operation of an amateur transmitting station in the United States designates a call which is to be used by that station at all times. This call consists usually of a number followed by two letters, as 1AB, but may consist of a number followed by three letters, as 1ABC. The number is the number of the radio district in which the station is located. "Experiment stations" have calls consisting of a number followed by two or three letters of which the first one is X, as 1XA. "Technical and training school" stations have calls consisting of a number followed by two or three letters of which the first one is Y, as 1YA. "Special amateur" stations have calls consisting of a number followed by two or three letters of which the first one is Z, as 1ZA. It is unlawful for any transmitting station at any time to sign any call except the call assigned in its station license.

Lists of radio calls.— Every radio amateur should have a copy of each of the pamphlets "Amateur Radio Stations of the United States," and "Commercial and Government Radio Stations of the United States," issued by the Department of Commerce, Bureau of Navigation, Radio Service. The price of each of the pamphlets is fifteen cents, and orders should be sent to the Superintendent of Documents. These pamphlets contain lists of the amateur, and commercial and Government transmitting stations in the United States, and of the call letters assigned to the stations. A new edition of each pamphlet is published on June 30 of each year. The monthly "Radio Service Bulletin" contains additions to or other changes in the list of "Commercial and Government Radio Stations."

"The Consolidated Radio Call Book," second edition, July, 1920, is published by the Consolidated Radio Call Book Co., 41 Park Row, New York, N. Y. This gives the calls of both United States and Foreign Stations.

A list of commercial and Government stations operating in the United States and in foreign countries is given in the "Year Book of Wireless Telegraphy," previously mentioned.